

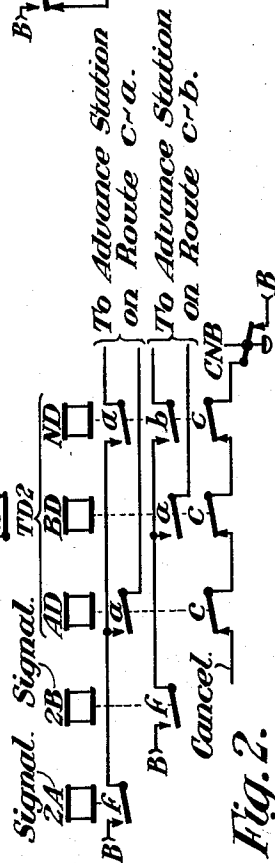
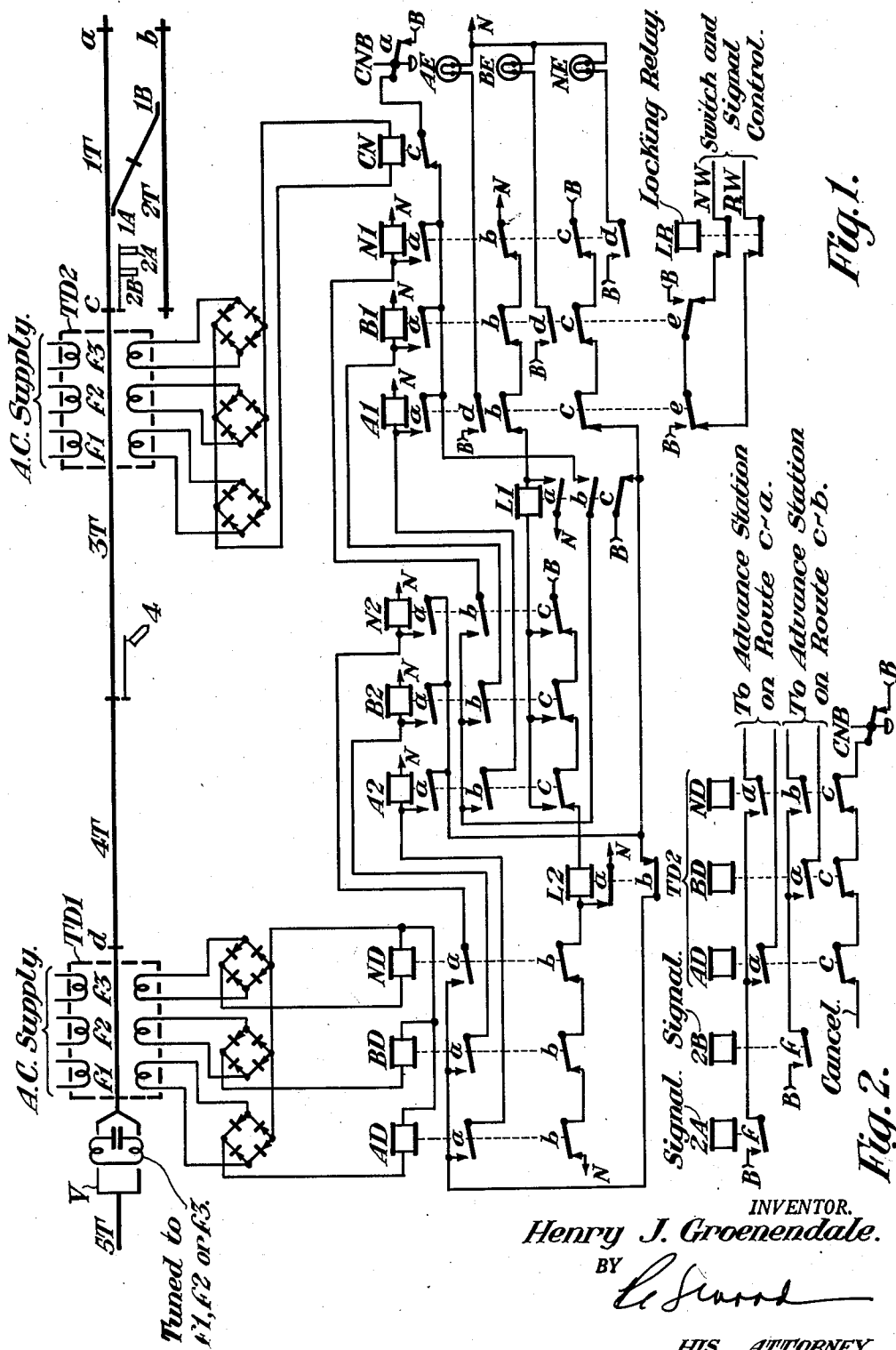
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2,670,434

TRAIN DESCRIBER SYSTEM

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TRAIN DESCRIBER SYSTEM

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1 Claim. (Cl. 246—124)

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My invention relates to a train describer system, comprising apparatus for indicating the class or destination of a vehicle, or the route it is to take, at a wayside station at the end of a predetermined course traversed by all of the vehicles to be indicated.

More particularly, my invention relates to improved apparatus for controlling an indicator located in a control tower or on a passenger station platform so as to display a visual identification of the next vehicle or train to arrive at the station over a predetermined course, and optionally, for controlling the switches and signals of an interlocking plant so as to establish the proper route for each approaching train in turn.

Heretofore, in train describer systems, the usual practice has been to manually set up an indication of the route or destination of each train by the operation of a selected one of a group of push buttons at its point of origin or at a rear station, as shown typically in Letters Patent of the United States No. 2,206,550, granted July 2, 1940, to Ralph Mordin, and to transmit this indication upon the departure of the train, as manifested by the occupancy of a track circuit, to an advance station where the indication is to be displayed, and to cancel the indication upon the arrival of the train at the advance station by a similar track circuit action. Since the stations may be separated by a considerable distance, a series of cascade connected storage indicators is usually provided at the advance station sufficient in number to store indications for all of the trains which may occupy the space between the two stations at any one time.

Train describer systems of the type mentioned tend to become quite complicated and expensive, and require close manual supervision to properly correlate the stored indications with the corresponding trains, due to the occasional occupancy of the controlling track sections by unidentified or unclassified trains, or when switching movements have to be provided for involving the repeated occupancy of the track section at one end only of the controlled territory, or in the event a second train enters a controlling track section before it is vacated by a first train.

In spite of the numerous opportunities for the display, by multiple storage indicators controlled by track circuits, of indications that are not properly in step with the corresponding trains, the checking or counting of train movements by their occupancy of certain track circuits has

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been practically necessary in systems of this character, in order to more positively insure that the operation of the system will be limited to at least one and only one storage and cancellation for each train passage.

The primary object of my invention is the provision of a train describer system which is wholly automatic and which is independent of track circuit conditions, thereby avoiding the difficulties mentioned.

The system of my invention is particularly adapted for use on railroads employing electric traction where alternating current track circuits are used, in view of its non-dependence upon the release of a track relay for counting train movements. This is because of the difficulty of avoiding adverse effects upon conventional train describer systems due to the temporary release of an alternating current track relay, in the absence of a train, as a result of a transfer from one power source to another, or due to faults in the interconnected power supply system from which the track circuit derives its energization.

By a suitable modification of the train reporting devices to adapt them for operation through greater clearances, the system of my invention is adapted for use to indicate the destination of highway vehicles such as busses, which pass over a predetermined course in approaching the station where the indications are to be displayed.

In the system of my invention, in lieu of setting up the indications for the different trains by the manual operation of push buttons at the point of departure, I employ a train reporting system of a suitable type, such as is disclosed, for example, in a pending application for Letters Patent of the United States, Serial No. 213,776, filed by Richard Treharne, on March 15, 1951.

In the train reporting system referred to, each train is equipped with a marker device comprising a normally inert coil connected to a condenser and mounted in a location such that the coil becomes inductively coupled momentarily to wayside windings when the train passes a reporting station. Each such coil is tuned to resonance at a particular frequency corresponding to a particular train destination or route, and each reporting station is provided with a plurality of primary windings, each constantly supplied with alternating current of a frequency different from that supplied to the others, and which is one of those to which the coils carried by the vehicles for a particular destination or route are resonant. Each of the primary wind-

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ings has a secondary winding associated therewith, to which a detector relay is connected, so arranged that the relay is operated momentarily on the passage of an equipped train, when a train carried coil tuned to the corresponding frequency is interposed, or at least is brought into proximity with the corresponding pair of windings. In this manner each passing train is caused to register its identification by the selective operation of a particular relay at the reporting station.

In accordance with a feature of my invention each indication received at a reporting station is transmitted immediately by the operated detector relay, without track circuit cooperation, to an advance station, where the indications are stored in a series of cascade connected indicators of any suitable type for successive display in the order of approach of the corresponding trains.

In accordance with another feature of my invention, I provide a second reporting device similar to the one described but located at the receiving station. This second reporting device has but one detector relay which is connected to all of its secondary windings so that it is operated nonselectively on the passage of any train which has identified itself by the action of its coil at the first reporting device, likewise without the cooperation of any track circuit apparatus. This second reporting device controls the storage indicator in such a manner that the momentary operation of a detector relay is effective to cancel the stored indication of the approaching train and to allow it to be superseded by the indication of the next following train, if one is stored.

The apparatus of my invention thus operates in such a manner that the same train carried coil is adapted to indicate the route or destination of a train approaching a station and to cancel its indication upon the arrival of the train.

In a modification of my invention the train carried coil is adapted to function in such a manner that on passing a station it not only cancels the indication of its route or class previously transmitted from a station in the rear, but in addition transmits its identification concurrently to an advance station located on the route established for the train. In this manner the reporting devices located at successive stations check correspondence between the trains and their stored indications on each train passage, thereby eliminating a source of error in prior systems in which the indications transmitted on the passage of trains are the stored indications set up by previous transmission from rear stations.

In practicing my invention, I propose to equip each unclassified train which moves through the territory equipped with the apparatus of my invention with a special coil and to provide corresponding means governed thereby for displaying an indication of an unclassified train. The system of my invention has the advantage that in the event an unequipped train is interposed and moves through the controlled territory between two equipped trains, the proper display of the indications for the equipped trains is not interfered with.

Since the train reporting device employed for registering the indications does not require the manual supervision to take care of irregular

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train movements as is the case when track circuits are used, this device may be located at a point where it is not convenient to provide such supervision, as for example at an intermediate point in automatic block signal territory, preferably at a minimum distance in the rear of the point where the indications are to be displayed. For the control of the switches and signals of an interlocking plant, the preferred location for this reporting device is at the entrance to the usual approach zone in the rear of the entering signal which governs train movements into the plant, so as to enable a route to be set up and the entering signal and the corresponding distant signal to be cleared in ample time to enable the engineman of an approaching train to observe the distant signal at clear, without reducing the speed of his train. The second reporting device, used for cancelling the route indication, is preferably located adjacent the entering signal, since the protection for the train movement through the plant is effected by the interlocking system the same as when a route is set up by manual control, the train describer system being utilized for communication purposes only.

The system of my invention thus has the advantage that in lieu of a system of line circuits extending from the points of origin of the trains to each indicator location as required for the conventional train describer systems, the system becomes one made up of relatively simple independent units, one for each station where indications are to be displayed. Each unit of the system uses much shorter line circuits and a correspondingly smaller number of storage indicators, two being usually sufficient, with the ultimate result that the system is simpler and more flexible and consequently more reliable.

I shall now described one form of apparatus embodying my invention, and shall then point out the novel features thereof in the claim.

In the accompanying drawings, Fig. 1 shows a diagram of a stretch of railway track equipped with circuits and apparatus embodying one form of my invention, while Fig. 2 shows a modification of a portion thereof. In Fig. 1, the track rails are represented diagrammatically by a single line, and are divided by insulated joints to form a series of track sections 1T, 3T, 4T and 5T. Section 1T is within the limits of the interlocking plant and includes two track switches 1A and 1B in a crossover which gives access to a parallel track section 2T. When the switches 1A and 1B are in their normal position, as shown, a main line route *c-a* is established over which traffic movements in the left to right direction are governed by a high speed entering signal 2A, and when the switches are reversed, a diverging route *c-b* is established over which traffic moving in the same direction is governed by a slow-speed entering signal 2B.

It is to be understood that each of the track sections is equipped with a track circuit having the conventional track relay for controlling the switches and signals and an associated system of relays by which they are interlocked in a conventional manner, but since an explanation of these elements is not needed for an understanding of my invention, and for the further reason that the apparatus of my invention functions independently of the track relays, these relays are not shown herein.

The portion *d-c* of the stretch constitutes the approach zone for the entering signals, a dis-

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tant signal 4 being located at the entrance to section 3T. It is to be understood that signal 4 is controlled in a conventional manner so that it normally indicates caution as shown and indicates proceed only when route c-a is established and signal 2A indicates caution or proceed.

The train reporting system used in the system of my invention is embodied in the two devices TD1 and TD2, located at points d and c, respectively. Each of these devices includes a plurality of primary windings each of which is constantly supplied with alternating current of a frequency f1, f2 or f3 different from that supplied to the others, and which identifies a particular destination, route or class of train. Each primary winding has a corresponding secondary winding connected through a rectifier to a detector relay such as AD, BD, ND or to a cancelling relay CN, but is adapted to supply current to its secondary winding to energize the relay only when a coupling coil tuned to resonance at that particular frequency is interposed, or at least, is brought into proximity with the corresponding pair of windings.

Each train to be identified, as typified by the vehicle V, is equipped with such a coil, tuned to resonance at a selected one of the different frequencies f1, f2 or f3.

To simplify the drawings, only the minimum amount of apparatus deemed necessary to illustrate the principles of my invention is shown. The track layout is arranged to provide only two routes, for example, and the train reporting system is supplied with only two route identifying frequencies f1 and f2 for the two routes c-a and c-b, respectively, with the addition of a third frequency f3 for registering the passage of a train without designating the route it is to take.

It will be evident from the foregoing that when an equipped train passes the reporting device TD1, a selected one of the relays AB, BD or ND will be momentarily energized, depending upon whether the resonant frequency of the train carried coupling coil is frequency f1, f2 or f3, and when the train passes the second reporting device TD2 relay CN will be momentarily energized irrespective of whether the train carried coil is tuned to frequency f1, f2 or f3.

The series of storage indicators may be arranged in any suitable manner and as here shown, is of the type disclosed and claimed in Letters Patent of the United States No. 2,171,756, issued September 5, 1939, to Lloyd V. Lewis. The storage indicator system includes a first unit for registering the indication for the first train to arrive at point c, comprising the register relays A1, B1 and N1 and a lockout relay L1, and a second unit comprising the similar relays A2, B2, N2 and L2 for temporarily storing the indication of a train which passes point d at a time when an indication of a preceding train is stored in the first unit.

The first unit may control a visual indication means as illustrated by the lamps AE, BE and NE which are selectively lighted when the corresponding register relays are energized to indicate the approach of a train having the destination a or b, or the approach of an unidentified train, respectively, and these lamps may be placed in a control tower for the guidance of an operator or on a passenger station platform for the information of the public.

Relays A1 and B1 may also govern route control apparatus for establishing route c-a or

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c-b automatically by energizing a wire NW or RW for the control of an interlocking control system as indicated schematically in the drawing, it being understood that these circuits are arranged to be closed only under proper traffic conditions as typified by the energization of a locking relay LR.

The push button CNB is an emergency key such as it is the practice to provide in apparatus of this character to enable the stored indications to be manually cancelled if desired.

The operation of the train describer system of my invention is as follows, assuming first that the apparatus is in its normal condition as shown: When a train equipped with a coupling coil tuned to the frequency f1 passes the device TD1 at point d, relay AD becomes momentarily energized.

At this time the relays A2, B2 and N2 are released and available for the storage of indications. This is made manifest by the fact that relay L2 is energized to condition the unit to receive an indication, over a circuit which extends from one terminal B of a local source of energy over back contacts c of relays N2, B2 and A2 through the winding of relay L2 to the other terminal N of the same source over back contacts b of relays ND, BD and AD.

When relay AD is operated, relay L2 is held energized over a stick circuit comprising a connection to terminal N over its own front contact a, and relay A2 becomes energized over a circuit from terminal B over back contact c of relay L1 and also over back contacts c of relays N1, B1 and A1 in series, contact b of relay L2, contact a of relay AD, through the winding of relay A2 to terminal N, and relay A2 picks up and completes a stick circuit at its front contact a which extends to terminal B over back contacts c of relays A1, B1 and N1 in series and also to terminal B over back contact c of relay L1.

When relay A2 picks up, the operation of its contact c releases relay L2. Since the relays A1, B1 and N1 are released and available for the storage of indications, relay L1 now becomes energized to condition the associated unit to receive an indication over a circuit from terminal B over back contacts c of relays N2 and B2, front contact c of relay A2, the winding of relay L1, to terminal N over the back contacts b of relays A1, B1 and N1 in series.

Relay L1 picks up, opening one of the two connections to terminal B for the circuit of relay A2, and causes relay A1 to become energized over the circuit from terminal B at contact a of an emergency push button CNB, back contact a of relay CN, front contacts b of relays L1 and A2, through the winding of relay A1 to terminal N.

Relay A1 picks up and completes a stick circuit at its contact a and so remains energized; relay L1 is held energized over the stick circuit including its own front contact a, by relay A2, but the stick circuit for relay A2 is now open at back contacts c of relays A1 and L1 so that relay A2 releases and then, due to the opening of front contact c of relay A2, relay L1 releases. By closing its front contact d, relay A1 lights lamp AE to indicate that c-a is the route for the approaching train, and by closing its front contact e, relay A1 connects terminal B to wire NW under proper traffic conditions to automatically establish that route.

In response to the release of relay A2 mentioned above, relay L2 is reenergized, unless the

train is still in proximity to the device TD1, in which case it may happen that the operations initiated by relay AD are completed before it returns to its released position. In that case, relay L2 is energized when relay AD releases, due to the movement of the train away from point *d*.

It will be noted that only one operation of relay A2, B2 or N2 of the second storage unit will occur for each train passage for the reason that each such operation involves a complete cycle of operation of the corresponding detector relay AD, BD or ND.

It will be seen that if the train which passed the device TD1 had been equipped with a coupling coil tuned to frequency *f*₂ or *f*₃ instead of to frequency *f*₁, a similar sequence of events would have occurred, involving different indication relays; relay BD or ND would become momentarily energized, then relay B2 or N2 would pick up to release relay L2 and to energize relay L1, and finally relay B1 or N1 would pick up and remain energized, releasing relay L1. Relay B1, when energized, lights lamp BE to indicate the approach of a train for route *c—b* and connects terminal B to the route circuit RW, while relay N1 when energized does not complete any route circuit but merely indicates the approach of an unclassified train by the lighting of lamp NE.

Assuming that when relay A1 is energized, as described above, a second train equipped with a coil tuned to frequency *f*₂, for example, passes point *d*, that is to say, before the first train reaches point *c*; it will be evident that in this case, relays BD and B2 will become energized and relay L2 will release, but relay L1 will remain released and the indication for the second train will remain stored in the second storage unit. Since relay B2 is energized, relay L2 remains released and prevents the reception of an indication of a third train as long as two indications are stored. However, additional storage units may be readily provided to store indications for additional trains, if needed, as taught by the Lewis patent.

When the first train passes the second reporting device TD2, at point *c*, relay CN is momentarily energized, and releases relay A1, rendering the first storage unit available for the storage of an indication of a second train, and if there is one stored in the second unit, relay L1 becomes energized. In the case being described, relay L1 becomes energized when relay A1 releases, because front contact *c* of relay B2 is closed, and when relay CN releases, relay B1 picks up over back contact *c* of relay CN, and front contacts *b* of relays L1 and B2. Then relay B2 releases, because its stick circuit is opened at back contacts *c* of relays L1 and B1. Relay L1 releases due to the opening of its stick circuit at front contact *c* of relay B2, and relay L2 becomes energized due to the closing of its pickup circuit at back contact *c* of relay B2.

The indication for the second train is now stored in the first unit; lamp BE is lighted to indicate that route *c—b* is the route for this train and wire RW is connected to terminal B under proper traffic conditions to establish the route for this train.

When the second train passes the second reporting device TD2, at point *c*, relay CN is again momentarily energized, and releases relay B1 to extinguish lamp BE, which completes the restoration of the apparatus to the condition it was in prior to the entry of the first train.

It is to be noted that but one operation of re-

lay A1, B1 or N1 will occur for each train movement past point *c* for the reason that an indication is not supplied to the first storage unit until relay CN releases, following a period of energization sufficient to cancel the previously stored indication, or in other words, each cancellation is the result of a complete cycle of operation of relay CN.

In a modification of the apparatus of my invention, Fig. 2 is substituted for a portion of Fig. 1 relating to the second reporting device TD2 at point *c* which in this modification is identical with the device TD1 at point *d*. Each of its detector relays AD, BD and ND has a back contact *c* which replaces the corresponding contact of relay CN of Fig. 1 in the holding circuits for the storage relays A1, and which likewise serves to cancel the indication of an approaching train as soon as it arrives at point *c*.

In addition, the reporting device TD2 of Fig. 2 is arranged to serve as a transmitter like the device TD1 of Fig. 1 so that the coil on each train, the movement of which is authorized by the clearing of signal 2A or 2B, will upon passing point *c*, cause the transmission of its identification to an advance station located on the route established for the train. As shown diagrammatically in Fig. 2, when signal 2A is cleared, it closes a contact *f* to condition relay AD or ND to transmit an indication to a station located at a point in advance on route *c—α*, and when signal 2B is cleared it similarly conditions relay BD or ND to transmit an indication to a station located at another point in advance on a different route *c—δ*.

It will be understood that when the apparatus of my invention is used for controlling indicators on passenger station platforms, different indications will be required to distinguish trains having different destinations but which pass over the switches 1A and 1B shown herein, in the same position, and consequently a larger number of storage relays will be required in each unit at such locations than at other locations where the apparatus is used only for route control or indication. At the latter locations, the detector windings for different destinations but involving the same route at the location in question may be connected in parallel to control the same detector relay AD or BD as shown for the cancelling relay CN.

Although I have herein shown and described only one form of apparatus embodying my invention and one modification thereof, it is understood that various changes and modifications may be made therein within the scope of the appended claim without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

An automatic train describer system for identifying trains which pass over diverging routes in a track layout which includes a track switch and a signal for each route for governing train movements over said switch, comprising a marker coil on each train having distinctive electrical characteristics which identify its route, two inductive reporting devices, one adjacent said signals and one at the entrance to an approach zone in the rear of said signals, each controllable by a marker coil on a passing vehicle, a wayside indicator for storing an indication identifying the route of a train occupying said approach zone, the reporting device at the entrance to said ap-

proach zone being effective when a marker coil is in proximity thereto to transmit a route indication for storage in said indicator, the reporting device adjacent said signals being effective when a marker coil is in proximity thereto to cancel said stored indication, and control means for governing the operation of said switch and signals controllable in accordance with the route indication stored in said indicator.

HENRY J. GROENENDALE.

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